PHYTOCHEMICAL AND FATTY ACIDS PROFILE OF Soymida febrifuga*(Roxb.)* *A. Juss.* SEED

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ABSTRACT

The seed of *Soymida febrifuga* was analyzed to determine its chemical composition. Analysis of theseseed and seed oils will help group them and make their best use in medicinal and nutritional significance. The cations composition (Cu^{++}, Zn^{++}, Fe^{+++}, Mn^{++}, Ca^{++}, Na^{+} ,K^{+},Mg^{++}) of the seed was determined using AAS and flame photometer, while the fatty acid composition was evaluated using gas chromatography. The phytochemical analysis determined the qualitative and quantitative analysis of seed and oil. The seed oil carried 34.4% fat, an iodine value of 57.1gm/100gm, a saponification value of 42.04mg KOH/gm, an acid value of 29.92mg/g, and unsaponifiable matter of 5.97%. The results show the presence of Palmitic acid 34.37%, Stearic acid 10.21%, Linoleic acid 20.01%, α- Linolenic acid 15.63%, and Oleic acid 15.55% are abundant in seed oil.

KEYWORDS: Phytochemicals, qualitative and quantitative analysis, fatty acids, seed.

DOI Number: 10.14704/NQ.2022.20.12.NQ77230 NeuroQuantology2022;20(12): 2483-2489

INTRODUCTION

Reference to plants being used for medicinal purposes goes a long way back in history. As per some studies, it goes back to the Neanderthal era [1]. Ayurvedic, Unani, Traditional Chinese, and many other cultures provide information on the application of herbal medicines for treating many ailments. Many pharmaceutical companies are using these sources to derive several new products. Some recent new products include galanthamine, whose source plant is Galanthus woronowiis, for treating Alzheimer and podophyllotoxin source plant Podophyllum peltatum for treating cancer [2]. Some of the most famous drugs or medicines derived from plants are aspirin from Salix spp, quinine from Cinchona ledgeriana, and morphine from Papaver somniferum [2]. Many other studies have been done to analyze the medicinal properties of plant extracts [3]. This paper focuses on seed oil's phytochemical & fatty acid analysis for various medicinal purposes. Several types of research and studies have been done on seed oil for their application for broad spectra of its therapeutic potential, such as antibacterial, anti-microbial, antiviral, anti-inflammatory, antioxidant, and other properties [4][5].

Also known as Indian Redwood, *Soymida febrifuga* is a semi-deciduous large tree with a height of up to 30 meters. It grows in dry to moist, mainly lowland areas in the tropics and is also commonly known as Rohan and belongs to the Meliaceae family. Soymida means God, and febrifuga refers to the expulsion of fever. It's an endemic medicinal plant of India. A review of various literature shows that the plant and its different parts can be used for medicinal purposes; its root callus can be used for antibacterial and antifungal properties [6] and is also used to treat fever [7]. Soymida febrifuga is an ethnic medicinal plant found in North West, Central, and South India. It is also found in Sri Lanka [8].The seeds have also been found in Chhattisgarh [9] and, for the studies, have been collected from the wilds of the Chhattisgarh Region.

eISSN 1303-5150

MATERIALS AND METHODS

MATERIAL

The seeds sample were collected from the forest area of Chhattisgarh. Dirt and other foreign materials were cleaned up, and the husk shell of the seed was removed manually. The seeds were subsequently grounded in a mixer grinder for analysis.

OIL EXTRACTION

Oil was extracted from seeds of *Soymida febrifuga using* a Soxhlet extractor with petroleum ether asthe solvent. 239 grams of the pulverized seed was put in the Soxhlet extractor with petroleum etherfor about 10 hours (the boiling point was between 60-80° c). Excess solvent was removed through a rotary evaporation procedure. The oil yield was calculated and stored in a refrigerator for further analysis [10] [11].

PHYSICOCHEMICAL ANALYSIS

The extracted light orange oil obtained a 34.40% yield. The oil was analyzed for iodine value, saponification value, acid value, free fatty acid, and unsaponifiable matter by the standard method described in AOAC [12]. With the increase in unsaturation and depending on the chain length of Fatty Acid, the refractive index increases. The refractive index of the oil slightly above room temperature was determined with an Abbe refractometer [13]. Specific gravity is determined to check the density of the oil. The specific gravity bottle determined the oil slightly above room temperature [14].

MINERALS COMPOSITION OF SEED

To get the quality of oil regarding freshness, storability, & toxicity, it is essential to evaluate metals contents. Some metals like Iron, Copper, and Manganese are known to increase the rate of oil oxidation [15]. Approximately 1.0 gram of samples ground in a mortar pestle were take,n and using microwave digestion, and atomic absorption spectrometry, the content of copper, iron, and zinc were determined [15]. A known quantity of dehulled grains was put along with Ten milliliters of conc Nitric acid (69% HNO3, EMPARTA, Merck) and kept in a pressure vessel. The vessels were loaded into the microwave digestive system. The digested samples recovered from the vessel were then subjected to AAS to determine the content of Iron, Zinc, Copper, and Manganese. To Determination of Sodium, Potassium, and Calcium was carried out with a flame photometer [16]. This analysis wasachieved by digesting the sample using 10 ml of nitric acid (69%) [16].

FATTY ACID COMPOSITION OF SEED OIL

The fatty acid composition was determined by applying the methyl-esterification process & subsequent gas chromatography/flame ionization detection [17]. For converting Soymida febrifuga oil seed to FAME, the oil was mixed with 5ml of 0.5 M KOH, and the mixture was heated at 60°C for around 3-4 minutes and was allowed to cool down. After cooling down, BF3 solution was added in proportion, and the mixture was again heated at 60°c for 3 minutes and again allowed to cool down.

Using Isooctane, the upper layer of the mixture was transferred to the tube containing sodium sulfate to remove the moisture. After following the process of trans-esterification Fatty acids were estimated by Gas Chromatograph (7890B of Agilent Technologies) equipped with flame ionization detector and Agilent – DBFFAP column (nitroterephthalic-acid-modified polyethylene glycol (PEG) of high polarity for

eISSN 1303-5150

the analysis of volatile fatty acids) [18]. Calibrating the Gas Chromatograph (for fatty acid required the column temperature to be maintained at an initial temperature of 120°C for 5-6 minutes, and it was raised to 240 at the rate of 4°C /min. Nitrogen was used as carrier gas at a column flow rate of 1.0 ml/min. Detector temperature was maintained at 280°C. Standards used were 47885-U Supelco® 37 Component FAME. Mix, 10 mg/mL in methylene chloride. Individual trans-fatty acids standards, Supelco trans-9-Eliadic methyl ester, 10 mg/ml in heptane, trans-9, 12-Octadecadienoic (linoleliadic) methyl ester, and trans- 11-Vaccenic methyl ester, were used. Sample fatty acid composition was compared with standard fatty acid composition, and percentages were calculated by normalization of peak areas.

TABLE 1: Results of characterization of *Soymida febrifuga*

Parameters	Values
Colour	light orange
Oil (%)	34.40
Refractive index	1.422
Specific gravity	0.829
Saponification value	42.075mg KOH/gm
Iodine value	57.1gm/100gm
Acid value	29.92mg/g
Unsaponifiable matter	5.97
Free fatty acid%	14.96

TABLE 2: Mineral Composition of the *Soymida febrifuga* seed

Minerals	PPM
Iron (Fe)	104.5215327
Zinc (Zn)	154.8122856
Copper (Cu)	52.26076637
Manganese (Mn)	14.78329137
Sodium (Na)	38.26
Potassium (K)	1.73
Calcium (Ca)	57.95
Lithium (Li)	16.31

TABLE 3: Fatty Acid Composition of the *Soymida febrifuga* seed oil

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SATURATED FATTY ACIDS	COMPOSITION	UNSATURATED FATTY ACID	COMPOSITION
MYRISTIC ACID (C10:0)	0.2	PALMITOLEIC ACID(C16:1)	0.22
PALMITIC ACID (C16:0)	34.76	OLEIC ACID (C18:1N9C)	15.55
HEPTADECANOIC ACID (C17:0)	0.16	LINOLEIC ACID(C18:2N6C)	20.01
STEARIC ACID (C18:0)	10.21	α-LINOLENIC ACID(c18:3n6)	15.63
ARACHIDIC ACID(C20:0)	0.19	ALPHA-LINOLENIC ACID (C18:3N3)	0.88
HENEICOSANOIC ACID(C21:0)	0.07	CIS-11-EICOSENOIC ACID (C20:1N9)	0.06
BEHENIC ACID (C22:0)	0.81	CIS-5,8,11,14,17-EICOSAPENTAENOIC ACID(C20:5)	0.23
LIGNOCERIC ACID (C24:0)	0.19	CIS-13,16-DOCOSADIENOIC ACID(C22:2)	0.3
HEPTADECANOIC ACID (C17:0)	0.16	NERVOINIC ACID (C24:1N9)	0.45
		ERUCIC ACID (C22:1n9)	0.09

RESULTS

The results of the seed oil characterization, extraction of oil, refractive index, specific gravity, acid value, iodine value, etc, are shown above in *Table 1.* The concentration of metal and traces for the seed is captured in *Table 2*. The fatty acid composition of the oil is presented in *Table 3*

CONCLUSION

From the phytochemical analysis & characterization perspective, the *oil content* of *Soymida ferifuga* is 34.4%. The *Refractive Index* of the seed oil is 1.422. Refractive Index indicates fatty acid chain length and the degree of unsaturation. This also shows that as compared to most drying oils having refractive indices between 1.48 and 1.4949, this oil seed is less thick [19]. The *acid value* of the seed is 29.92 mg/g & while considering the acid values with other well-known seeds [20] indicates that it's not an edible oil. *The iodine value* is found to be 57.1gm/100gm. This implies that this is a non-drying oil [20]. The saponification value for the seed is 42.075mg KOH/gm. The results are in line with observations confirming that this is not an edible oil and use in the soap industry will be difficult [20]. The specific gravity of *Soymida febrifuga* is 0.829. Specific gravity analysis and other analysis procedures can be used to determine the physical quality parameter of the oil.

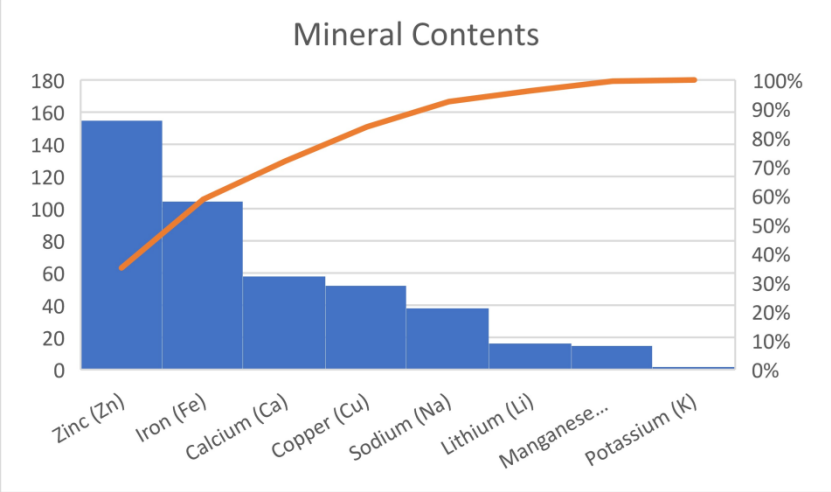
The mineral contents are an important parameter for seed oil characterization. The mineral contents infound in 1 gram of seeds

eISSN 1303-5150

of *Soymida febrifuga* are Iron:104 mg, Zinc:154 mg, Copper: 52 mg, Manganese: 14 mg, Sodium: 38 mg, Potassium: 1.73 mg, Calcium: 57.95 mg & Lithium: 16.31 mg.

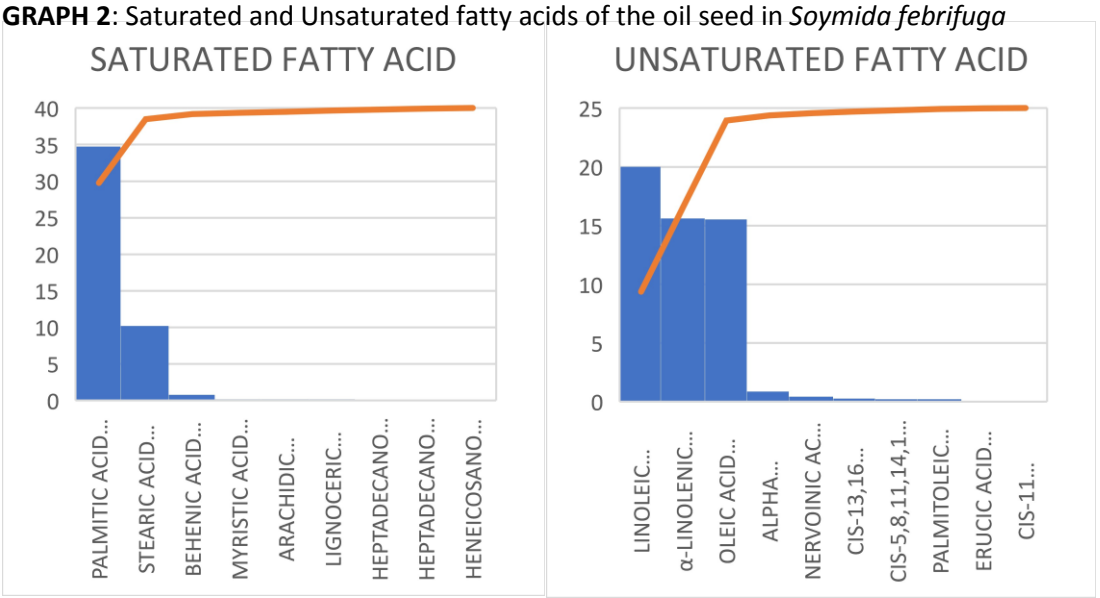
Graph-1 shows the distribution of minerals for the seed. The minerals most abundant in the seeds of*Soymida febrifuga* are Zinc & Iron. Iron helps in oxygen binding to hemoglobin and controls infection. Zinc can assist in wound healing [21].

GRAPH 1: Mineral contents of the oil seed in *Soymida febrifuga*



The fatty acid composition of the seed of *Soymida febrifuga* is shown in Graph-2. Based on the analysis, it seems that Saturated fatty acid PALMITIC ACID METHYL ESTER (C16:0) & STEARIC ACID METHYL ESTER (C18:0) have the highest percentage of 34.76 & 10.21, respectively. Under the Unsaturated fatty acid, the content of LINOLEIC ACID (C18:2N6C) was the highest, followed by α-LINOLENIC ACID(c18:3n6) & OLEIC ACID (C18:1N9C), 20.01, 15.63 and 15.55 respectively. Overall, the unsaturated fatty acid content was more (53.42 %) than o Saturated fatty acid (46.75). The fatty acid can help assist in particular cardiovascular diseases and might benefit patients with hypertension, diabetes, etc. [22]

GRAPH 2: Saturated and Unsaturated fatty acids of the oil seed in *Soymida febrifuga*



eISSN 1303-5150

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eISSN 1303-5150